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EXAMINER

WITKOWSKI, ALEXANDER C

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/567,710	Applicant(s) NISHIO ET AL.	
	Examiner ALEXANDER C. WITKOWSKI	Art Unit 2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 August 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 16-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>05/29/2008</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicants' election without traverse of Group I, Claims 1 - 15, in the reply filed on 12/29/2008 is acknowledged.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 - 10, 12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peeters et al. (US 6,340,216) in view of Jinnai (US 4,328,505) and Lin et al. (US 6,328,393).

Regarding claim 1, as currently amended, Peeters et al. teaches an electrostatic suction type fluid discharge device (Fig.3: showing meniscus at ports 42 charged by electrode 54), in which drive voltage supply means supplies a drive voltage between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole

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of the nozzle to the discharge target (Fig.3: 42, 54), and a drive voltage with bipolar pulse voltage which **has a frequency of not less than 1 Hz** (Peeters et al.: col.20, Table 2: disclosing AC drive frequency at 2 kHz).

However, Peeters et al. does not teach the drive voltage supply means outputting, as the drive voltage, a bipolar pulse voltage which **has a frequency of not less than 1 Hz, and which** alternates between positive and negative **such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage.**

Jinnai teaches the drive voltage supply means outputting, as the drive voltage, a bipolar pulse voltage which has a frequency of not less than 1 Hz, and which alternates between positive and negative such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage (Jinnai: 4,328,505: Fig.1: showing the print signal generator [drive voltage supply means] 14 outputting an alternating electric drive signal [bipolar pulse voltage] which has a frequency of not less than 1 Hz, and which varies and locks phases of the drive signal generator and charging signal [such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage]; see col.1, lines 37-61) (Peeters et al.: col.20, Table 2: disclosing AC drive frequency at 2 kHz).

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It would have been obvious to one of ordinary skill in the art at the time of this invention to modify the invention of Peeters et al. with the invention of Jinnai so as to reduce the accumulation of charge from impinging charged droplets on the substrate target.

However, the combination of Peeters et al. and Jinai references does not teach the hole of the nozzle falling within a range between $\phi 0.01 \mu\text{m}$ and $\phi 25 \mu\text{m}$ in diameter. Peeters et al. also does not teach a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage.

Lin et al. teaches the hole of the nozzle falling within a range between $\phi 0.01 \mu\text{m}$ and $\phi 25 \mu\text{m}$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm).

It would have been obvious to one of ordinary skill in the art at the time that this invention was made to modify the inventions of Peeters et al. and Jinai with the invention of Lin et al. to provide the hole of the nozzle falling within a range between $\phi 0.01 \mu\text{m}$ and $\phi 25 \mu\text{m}$ in diameter, as taught by Lin et al., so as to produce ink droplets of relatively small diameter in order to achieve higher resolution print output.

Regarding claim 2, as currently amended, the combination of Peeters et al., Jinnai, and Lin et al. references teaches an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which drive voltage supply means supplies a drive voltage between a nozzle and a

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discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54),

the hole of the nozzle falling within a range between $\phi 0.01 \mu\text{m}$ and $\phi 25 \mu\text{m}$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the drive voltage supply means outputting, as the drive voltage, a bipolar pulse voltage which alternates between positive and negative **such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage** (Jinnai: 4,328,505: Fig.1: showing the print signal generator [drive voltage supply means] 14 outputting an alternating electric drive signal [bipolar pulse voltage] which varies and locks phases of the drive signal generator and charging signal [such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage]; see col.1, lines 37-61),

and satisfies $f \leq 1/(2\tau)$ where τ is a time constant determined by $\tau = \epsilon / \sigma$, f is a drive voltage frequency (Hz), σ is an electric conductivity (S/m) of the discharge fluid, and ϵ is a relative permittivity of the discharge fluid (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54, and having a frequency twice droplet transit time [$f \leq 1/2\tau$])

Regarding claim 3, as currently amended, the combination of Peeters et al., Jinnai, and Lin et al. references teaches an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which drive voltage supply means supplies a drive voltage between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54), and the nozzle and the discharge target are moved in a relative manner by shifting means, in a direction orthogonal to a direction along which the nozzle and the discharge target oppose to each other (Fig.3: showing discharged fluid directed orthogonally to a direction along which the nozzle 42 and discharge target 54 oppose each other; see also col.17, lines 63-64: disclosing that propellant redirects discharged fluid droplet from meniscus is pulled into channel 46),

the hole of the nozzle falling within a range between $\phi 0.01\ \mu\text{m}$ and $\phi 25\ \mu\text{m}$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm),

the drive voltage supply means outputting, as the drive voltage, a bipolar pulse voltage **which has a frequency of fHz and** which alternates between positive and negative **such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage**, (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar

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pulse] voltage driving material [fluid] 282 to electrode 54, and having frequency twice droplet transit time [$f \leq 1/2\tau$] (Jinnai: 4,328,505: Fig.1: showing the print signal generator [drive voltage supply means] 14 outputting an alternating electric drive signal [bipolar pulse voltage], which varies and locks phases of the drive signal generator and charging signal [such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage]; see col.1, lines 37-61), and

the electrostatic suction type fluid discharge device further comprising control means that controls at least one of the drive voltage supply means and the shifting means (Peeters et al.: Fig.1: showing control of propellant [fluid] 14 ejector 12 by drive voltage) in such a manner as to satisfy $f \geq 5v$ where f is a drive voltage frequency (Hz) of the drive voltage supply means and v indicates a relative speed ($\mu\text{m} / \text{sec}$) of the relative movement of the nozzle and the discharge target (choice of design to avoid gaps in printing).

Regarding claim 4, as currently amended, the combination of Peeters et al., Jinnai, and Lin et al. references teaches an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which drive voltage supply means supplies a drive voltage between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge

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to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54), and the nozzle and the discharge target are moved in a relative manner by shifting means, in a direction orthogonal to a direction along which the nozzle and the discharge target oppose to each other (Fig.3: showing discharged fluid directed orthogonally to a direction along which the nozzle 42 and discharge target 54 oppose each other; see also col.17, lines 63-64: disclosing that propellant redirects discharged fluid droplet from meniscus is pulled into channel 46),

the hole of the nozzle falling within a range between $\phi 0.01 \mu\text{m}$ and $\phi 25 \mu\text{m}$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the drive voltage supply means outputting, as the drive voltage, a bipolar pulse voltage **which is not more than 400V and** which alternates between positive and negative **such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage** (Peeters et al.: col.20: Table 2: disclosing drive voltages in the range of 0 to 500 volts) (Jinnai: 4,328,505: Fig.1: showing the print signal generator [drive voltage supply means] 14 outputting an alternating electric drive signal [bipolar pulse voltage], which varies and locks phases of the drive signal generator and charging signal [such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage]; see col.1, lines 37-61).

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Regarding claim 5, as currently amended, the combination of Peeters et al., Jinnai, and Lin et al. references teaches an electrostatic suction type fluid discharge method (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which a drive voltage is supplied between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54),

the hole of the nozzle falling within a range between $\phi 0.01 \mu\text{m}$ and $\phi 25 \mu\text{m}$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the drive voltage being a bipolar pulse voltage which **has a frequency of not less than 1 Hz and** alternates between positive and negative **such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage** (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54, and having a frequency twice droplet transit time; see also col.20, Table 2: disclosing AC drive frequency at 2 kHz) (Jinnai: 4,328,505: Fig.1: showing the print signal generator [drive voltage supply means] 14 outputting an alternating electric drive signal [bipolar pulse voltage] which has a frequency of not less than 1 Hz, and which varies and locks phases of the drive signal generator and charging signal [such that a positively charged fluid and a negatively charged fluid are

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alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage]; see col.1, lines 37-61).

Regarding claim 6, as currently amended, the combination of Peeters et al., Jinnai, and Lin et al. references teaches an electrostatic suction type fluid discharge method (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which a drive voltage is supplied between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54),

the hole of the nozzle falling within a range between $\phi 0.01 \mu\text{m}$ and $\phi 25 \mu\text{m}$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the drive voltage being a bipolar pulse voltage which alternates between positive and negative **such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage** and satisfies $f \leq 1/(2\tau)$ where τ is a time constant determined by $\tau = \epsilon / \sigma$, f is a drive voltage frequency (Hz), σ is an electric conductivity (S/m) of the discharge fluid, and ϵ is a relative permittivity of the discharge fluid (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54, and having frequency twice droplet transit time [$2f \leq 1/\tau$]) (Jinnai:

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Fig.1: showing the print signal generator [drive voltage supply means] 14 outputting an alternating electric drive signal [bipolar pulse voltage] which has a frequency of not less than 1 Hz, and which varies and locks phases of the drive signal generator and charging signal [such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage]; see col.1, lines 37-61).

Regarding claim 7, as currently amended, the combination of Peeters et al., Jinnai, and Lin et al. references teaches an electrostatic suction type fluid discharge method (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which a drive voltage is supplied between a nozzle and a discharge target (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54), and the nozzle and the discharge target are moved in a relative manner, in a direction orthogonal to a direction along which the nozzle and the discharge target oppose to each other (Fig.3: showing discharged fluid directed orthogonally to a direction along which the nozzle 42 and discharge target 54 oppose each other; see also col.17, lines 63-64: disclosing that propellant redirects discharged fluid droplet from meniscus, which droplet is pulled into channel 46),

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the hole of the nozzle falling within a range between $\phi 0.01 \mu\text{m}$ and $\phi 25 \mu\text{m}$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), as the drive voltage, a bipolar pulse voltage which **has a frequency of f Hz being outputted and** alternates between positive and negative **such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage**, and at least one of the drive voltage frequency fHz and a relative speed $v_{\mu\text{m}} / \text{sec}$ of the relative movement of the nozzle and the discharge target being controlled in such a manner as to satisfy $f \geq 5v$ (choice of design to avoid gaps in printing) (Jinnai: Fig.1: showing the print signal generator [drive voltage supply means] 14 outputting an alternating electric drive signal [bipolar pulse voltage] which has a frequency of not less than 1 Hz, and which varies and locks phases of the drive signal generator and charging signal [such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage]; see col.1, lines 37-61).

Regarding claim 8, as currently amended, the combination of Peeters et al., Jinnai, and Lin et al. references teaches an electrostatic suction type fluid discharge method (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54), in which a drive voltage is supplied between a nozzle and a discharge target (Fig.3: showing meniscus at ports 42 charged by electrode 54) and hence an electric charge is applied to a fluid supplied into the nozzle (col.17, lines 62-64: disclosing that electrode

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54 imparts proper charge to droplet from the meniscus), so that the fluid is discharged from a hole of the nozzle to the discharge target (Fig.3: 42, 54),

the hole of the nozzle falling within a range between $\phi 0.01 \mu\text{m}$ and $\phi 25 \mu\text{m}$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the drive voltage being a bipolar pulse voltage which **is not more than 400V and which** alternates between positive and negative **such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage** (Peeters et al.: col.20: Table 2: disclosing drive voltages in the range of 0 to 500 volts) (Jinnai: Fig.1: showing the print signal generator [drive voltage supply means] 14 outputting an alternating electric drive signal [bipolar pulse voltage], which varies and locks phases of the drive signal generator and charging signal [such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage]; see col.1, lines 37-61).

Regarding claim 9, as currently amended, the combination of Peeters et al., Jinnai, and Lin et al. references teaches an electrostatic suction type fluid discharge device (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54) that (i) discharges, by electrostatic suction, a discharge fluid through a fluid discharge hole of a nozzle of a fluid discharge head (col.17, lines 61-62: disclosing formation of parallel plate capacitor by meniscus and electrode 54), the discharge fluid being electrically charged by voltage application (col.17, lines 62-64: disclosing that electrode

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54 imparts proper charge to droplet from the meniscus), and (ii) causes the discharge fluid to land onto a substrate (col.24, lines 31-35), (iii) so as to form a drawing pattern by the discharge fluid on a surface of the substrate (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form),

the fluid discharge hole of the nozzle falling in a range between $\phi 0.01\mu\text{m}$ and $\phi 25\mu\text{m}$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the substrate being insulating (Peeters et al.: Fig 40E; col.9, line 63 to col.10, line 9: disclosing dielectric layer 316 to protect electrode 314),

the electrostatic suction type fluid discharge device comprising:

charge removal means for removing an electric charge on the surface of the substrate, before the discharge fluid is discharged onto the substrate (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54; note that substrate charge is zero when bipolar drive voltage is zero before each fluid discharge); and

fluid discharge means for discharging, **the discharge fluid onto the substrate from which the electricity has been removed by a which alternates between positive and negative such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage** (Jinnai: Fig.1: showing ink ejection head [fluid discharge means] 11 outputting droplets [discharge fluid] 29 onto drum [substrate] 22 with an alternating electric drive signal [alternating positive and negative

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charge] which varies and locks phases of the drive signal generator and charging signal [charged fluids are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage]; see col.1, lines 37-61).

Regarding claim 10, the combination of Peeters et al., Jinnai, and Lin et al. references teaches the electrostatic suction type fluid discharge device as defined in claim 9, wherein, the charge removal means removes the electricity on the substrate, in line with a predetermined pattern (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54; note that substrate charge is zero when bipolar drive voltage is zero before each fluid discharge).

Regarding claim 12, the combination of Peeters et al., Jinnai, and Lin et al. references teaches the electrostatic suction type fluid discharge device as defined in claim 11, wherein, the voltage applied when the fluid discharge means discharges the discharge fluid is not less than 340V (Peeters et al.: col.20: Table 2: disclosing drive voltages to 500 volts).

Regarding claim 15, as currently amended, the combination of Peeters et al., Jinnai, and Lin et al. references teaches an electrostatic suction type fluid discharge method (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54) in which (i) by electrostatic suction, a discharge fluid is discharged through a fluid discharge hole of a nozzle of a fluid discharge head, the discharge fluid being

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electrically charged by voltage application (col.17, lines 62-64: disclosing that electrode 54 imparts proper charge to droplet from the meniscus), and (ii) the discharge fluid is caused to land onto a substrate (col.24, lines 31-35), (iii) so that a drawing pattern is formed by the discharge fluid on a surface of the substrate (col.9, lines 63-66: disclosing preformed electrodes 314 in rectangular, annular, or other shape in plan form),

the fluid discharge hole of the nozzle falling in a range between $\phi 0.01 \mu\text{m}$ and $\phi 25 \mu\text{m}$ in diameter (Lin et al.: col.2, lines 29-32: disclosing nozzle diameters of 10 to 25 μm), and

the substrate being insulating (Peeters et al.: Fig 40E; col.9, line 63 to col.10, line 9: disclosing dielectric layer 316 to protect electrode 314),

an electric charge on the surface of the substrate being removed, before the discharge fluid is discharged onto the substrate (Peeters et al.: col.20, lines 36-47: disclosing AC [bipolar pulse] voltage driving material [fluid] 282 to electrode 54; note that substrate charge is zero when bipolar drive voltage is zero before each fluid discharge), and

the discharge fluid being discharged onto the substrate from which electricity has been removed **by a bipolar pulse voltage such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage** (Jinnai: 4,328,505: Fig.1: showing the print signal generator [drive voltage supply means] 14 outputting an alternating electric drive signal [bipolar pulse voltage] which has a frequency of not less than 1 Hz, and which varies and locks phases of the drive signal generator and

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charging signal [such that a positively charged fluid and a negatively charged fluid are alternatively discharged in accordance with a polarity of the bipolar pulse voltage applied as the drive voltage]; see col.1, lines 37-61).

4. Claims 11, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peeters et al. (US 6,340,216) in view of Jinnai (US 4,328,505) and Lin et al. (US 6,328,393), as applied to claims 9, 16, and 20 above, and further in view of Ohno et al. (US 6,096,468).

Regarding claim 11, the combination of Peeters et al., Jinnai, and Lin et al. references teaches the electrostatic suction type fluid discharge device as defined in claim 9, wherein, the fluid discharge means discharges the discharge fluid by applying a voltage which is arranged such that an electric field strength generated by electric charge concentration at a meniscus part (Peeters et al.: Fig.3: showing meniscus at ports 42 charged by electrode 54).

However, the combination of Peeters et al., Jinnai, and Lin et al. references does not teach that the electric field strength, when discharging the discharge fluid, is smaller than a discharge start electric field strength figured out by an equation for calculating Paschen curve.

Ohno et al. teaches that the electric field strength, when discharging the discharge fluid, is smaller than a discharge start electric field strength figured out by an

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equation for calculating Paschen curve (Ohno et al.: col.40, lines 43-50: disclosing need for field strength to be smaller than that calculated by Paschen curve).

It would have been obvious to one of ordinary skill in the art at the time that this invention was made to modify the combination of Peeters et al., Jinnai, and Lin et al. references such that the electric field strength, when discharging the discharge fluid, is smaller than a discharge start electric field strength figured out by an equation for calculating Paschen curve, as taught by Ohno et al., for the purpose of avoiding attraction and adhesion of the toner to the charging member, which would deteriorate the toner (Ohno et al.: col.40, lines 43-50).

Regarding claim 13, the combination of Peeters et al., Jinnai, and Lin et al. and Ohno et al. references teaches the electrostatic suction type fluid discharge device as defined in claim 11, wherein, the fluid discharge hole of the nozzle is not less than 16 μm or not more than 0.25 μm in diameter (Lin et al.: col.2, lines 27-32: disclosing nozzle diameters of 10 to 80 μm), and the voltage applied when the fluid discharge means discharges the discharge fluid is not more than 500V (Peeters et al.: col.20: Table 2: disclosing drive voltages in the range of 0 to 500 volts).

Regarding claim 14, the combination of Peeters et al., Jinnai, Lin et al., and Ohno et al. references teaches the electrostatic suction type fluid discharge device as defined in claim 11, wherein, the fluid discharge hole of the nozzle is not less than 7.4 μm or not more than 0.65 μm in diameter (Lin et al.: col.2, lines 27-32: disclosing nozzle diameters

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of 10 to 80 μm), and the voltage applied when the fluid discharge means discharges the discharge fluid is not more than 400V (Peeters et al.: col.20: Table 2: disclosing drive voltages in the range of 0 to 500 volts).

Response to Arguments

5. Applicants' arguments with respect to claims 1 - 23 have been considered but are moot in view of the new grounds of rejection that derive from amendments.

Conclusion

6. Applicants' amendments necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicants are reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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/A.C.W./

/Stephen D Meier/

Supervisory Patent Examiner, Art Unit 2853